

JVC®

JVC COMPANY OF AMERICA

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JVC®

The Perfect Experience / —

HD

High-Definition



High-Definition Digital Video Camera
GR-HD1

Sales Tips & Information

HD (High Definition) used to be a realm for professionals only, requiring a substantial budget to purchase and a professional camera crew to operate. But now JVC breaks down the barriers, putting HD performance within the grasp of consumers. People who are interested in HD for its unprecedented visual power, or simply because they already own an HDTV set, will quickly see the value of JVC's GR-HD1 — the HD CyberCam that lets anybody create their own hi-def movies.

For you the salesperson, we've compiled this booklet to help you effectively communicate the benefits of the GR-HD1 as a product, as well as HD as the next-generation visual standard.

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Lead-in Questions

Here are some questions you can ask your customer to figure out what aspect of the GR-HD1 is most likely to appeal to him or her.

Q1 Do you own or plan to own HDTV?

Do you want a camcorder that can take movies with quality that is clearly noticeable on an HDTV screen?

Maybe your HDTV purchase will be a few years away?

The GR-HD1 **records 720p Hi-Def images** with remarkable detail. → **P.11**

The **Component** (Y/Pb/Pr) outputs enable connection to the latest HDTV displays. → **P.16 & P.19**

Up-conversion to 1080i allows viewing on compatible monitors, PDPs and projection TVs. → **P.11 - 12**

Hi-Def images can be **down-converted** to regular **480i** for viewing on any NTSC TV. → **P.12**

S-Video and AV **composite** connectors for easy connection to any TV. → **P.16 & P.19**

Recording of 480i in regular **DV format** is also possible. → **P.11 - 12**

Q2 Were you planning on purchasing a 3-CCD digital video camera?

Would you like to have quality that is clearly superior to 3-CCD DV format video cameras?

JVC's **1.18 Megapixel Progressive® Scan CCD** with **Hybrid Complementary-Primary Digital Filter** and other technologies render 3-CCD unnecessary. → **P.7 - 8**

Q3 Do you have a Non-Linear Editing system?

Do you want to edit High-Definition images?

S-Video and AV composite connectors for easy connection to any TV. → **P.19**

Provided **MPEG Edit Studio Pro LE** software offers frame-accurate MPEG-2 editing with drag-and-drop simplicity. → **P.13 - 14**

Q4 Do you want to use High-Definition images in your work or hobby?

Do you want to keep your running costs low?

Hi-Res MPEG-2 images are recorded on **MiniDV cassette**, which is readily available and cost-effective. → **P.10**

Q5

Do you want to distribute your videos far and wide?

Do you want to create DVDs?

The provided **ImageMixer DVD** software lets you easily author your videos to DVD. → **P.15**

Do you own the HM-DH40000/DH30000 D-VHS deck?

MPEG-2 Transport Stream (TS) dubbing lets you archive perfect copies to D-VHS, or edit content using a PC and copy to D-VHS. → **P.14**

Do you want to make regular DV format recordings?

Recording of 480i in regular **DV format** is also possible. → **P.11**

Q6

Do you want professional quality without the excessive size (and weight)?

Do you want to take high-angle and low-angle shots with ease?

Rotating Grip allows shifting from low- to high-angle without removing your hand from the grip. → **P.17**

Do you need to use the camera in places with limited space?

Much **smaller and lighter** compared to professional HD camcorders, so it can go places other models can't. → **P.30**

Q7

What do you look for in a video camera?

High quality images.

1.18 Megapixel Progressive Scan CCD with Hybrid Complementary-Primary Digital Filter enable Hi-Def 720p recording. → **P.7 - 8**

High quality optics.

F1.8-1.9 Optical Zoom Lens for a bright image with minimum distortion throughout the zoom range. → **P.9**

Full manual user controls.

Manual Focus and Zoom Rings, Manual Exposure and BLC, Manual Shutter, Manual Iris, Manual White Balance. → **P.16**

Full set of interfaces.

i.LINK, USB, SD Memory Card Slot, Component Out (Y/Pb/Pr), Composite Out (S-Video/AV). → **P.16**

Editing and post-production potential.

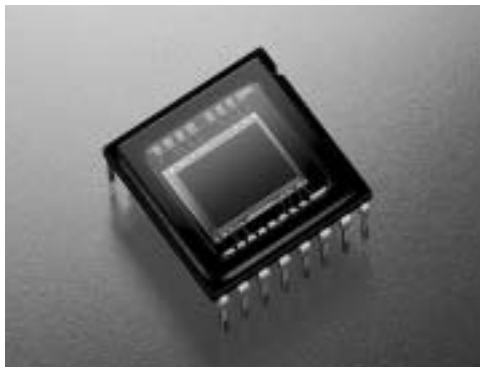
MPEG Edit Studio® Pro LE, ImageMixer DVD, Audio Converter, HD Capture Utility all come provided. → **P.13**

The Definitive Solution

The GR-HD1 is able to do what has long been considered impossible — record a true Hi-Def image using only one CCD. This section outlines how JVC did it.

1/3" 1.18 Megapixel Progressive Scan CCD

- **Progressive scanning** for clear image without the interline motion blur caused by Interlace scanning.
- Pixel array of **1280 x 720** (for moving images) and **1280 x 960** (for stills).



Hybrid Complementary-Primary Digital Filter

- Uses **2 complementary colors** Yellow and Cyan (Ye and Cy), **1 primary color** Green (Gr), and clear (W).
- Shifts one pixel at a time across the CCD and combining samples together in **pairs for brightness** and **blocks of four for color**, delivering maximum resolution.
- Color performance **nearly identical to 3 CCDs**.



Y (Luminance) information is obtained from pairs of picture elements:

$$\text{Yodd} = (W+G) = (R+2G+B)$$

$$\text{Yeven} = (Cy+Ye) = ((G+B)+(R+G)) \\ = (R+2G+B)$$

C (Chroma) information is generated by combining blocks of four picture elements:

$$R = (W+Ye) - (G+Cy)$$

$$G = (G+Cy+Ye) - W.$$

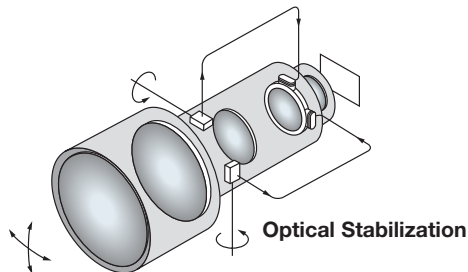
$$B = (W+Cy) - (G+Ye).$$

Sample Count Comparison between

1280x659 CCD(s)	CCD Elements	Luma Samples	RGB Chroma Samples
JVC Single CCD	843,520	843,520	841,582
Three CCD	843,520	842,861	841,582

Hi-Def F1.8–F1.9 Optically Stabilized Zoom Lens

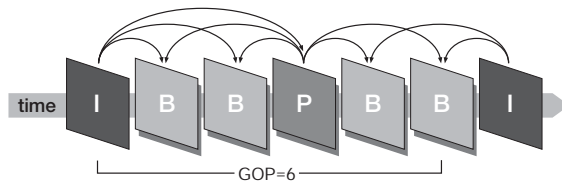
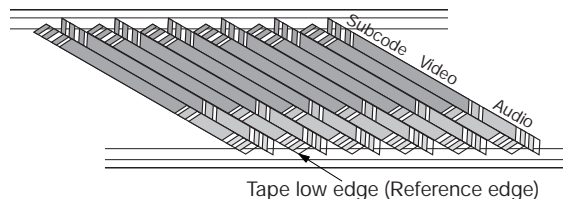
- Almost **no variance in brightness** from full wide to full telephoto.
- **Multi-coated** all-grass optics for **low-distortion, ghost-free** images.
- High **periphery resolution and brightness**, high **edge-to-edge color purity**.
- Manual focus and zoom rings on lens barrel.
- Optical Image Stabilizer using shift lens, original lens servo, and new camera shake detection algorithm for superior accuracy with no loss of resolution.



Lens Specification	when compared to a 35mm still camera	
F1.8 - F1.9, f = 5.2mm ~ 52mm	40.3mm ~ 403mm	16:9 HD mode
	55.0mm ~ 550mm	16:9 SD mode and 16:9 DV Anamorphic mode
Filter Diameter 52mm	67.8mm ~ 678mm	4:3 DV mode
	47.7mm ~ 477mm	4:3 DV D.Wide mode
	37.1mm ~ 371mm	4:3 Digital Still memory mode

HD MPEG-2 Recording on MiniDV Cassette

- Same tape speed and track pattern as DV, with **time axis also encoded**.
- Conforms to **DVB** and **ATV** standards.
- **GOP (Group Of Pictures) = 6** to facilitate frame-accurate editing.



MPEG-2

In HDTV, high power MPEG encoding eliminates redundant information over time.

I : I Frame (Intra Coded Frame)

B : B Frame (Bi-directionally Predictive Coded Frame)

P : P Frame (Predictive Frame)

The Unprecedented Power

JVC's innovative technology puts the power of 720p within the grasp of consumers. This section touches on the tangible benefits offered by this power.

Multi-Format Recording and Playback

• **HD Mode MPEG-2** 16:9 Image size: 1280 x 720 Recorded Horizontal resolution: 700 16:9 TV lines*, Vertical resolution: 650 TV lines

• **SD Mode MPEG-2** 16:9 Image size: 940 x 480 Recorded Horizontal resolution: 400 16:9 TV lines*, Vertical resolution: 480 TV lines

• **DV Mode** 16:9 Image size: 940 x 480 (Anamorphic Squeeze mode) Recorded Horizontal resolution: 400 TV lines*

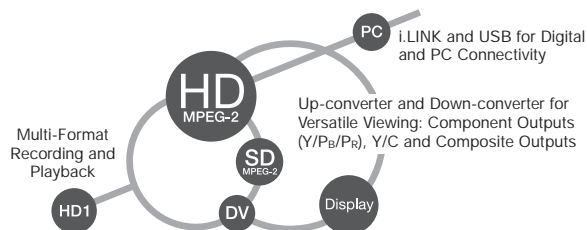
4:3 Image size: 720 x 480 standard / 940 x 646 wide-angle 30psf (D.Wide)

Recorded Horizontal resolution: 540 TV lines
Vertical resolution: 360 TV lines

* All "TV line" standard measurements are relative to the diameter of a circle the same size as the picture height. 16:9 Horizontal TV lines figures appear to be 75% of the equivalent 4:3 Horizontal TV Lines would be if the measurement was relative to the whole picture width, since the image is wider. (for example, the count for the GR-HD1 HD mode would be around 1244 TV lines per picture width, while the count would be about 933 TV lines per picture width for a 4:3 camera if both had 700 TV lines counting by standard horizontal resolution). DV has a practical recorded horizontal limit of 540 4:3 TV lines, 1280x720p HD has a practical recorded limit of 720 16:9 TV lines using the standard measurement method)

Digital Recording	
Encoding	Image/frame rate (screen ratio)
MPEG-2	720/30p Progressive (16:9) HD
	480/60p Progressive Widescreen SD (16:9)
DV	480 interlace (4:3)

Playback/Output		
Analog		Digital
Y/C, Composite	Component	i.LINK (IEEE1394)
7480 interlace 16:9 wide or 4:3 letterbox	1080 interlace HD	720/30p Progressive (16:9) HD
	720/60p HD	
	480/60p Widescreen SD	
	480i 16:9 wide or 4:3 letterbox	
4480 interlace 16:9 wide or 4:3 letterbox	1080 interlace HD	480/60p Progressive Widescreen SD (16:9)
	480/60p Widescreen SD	
	480i 16:9 wide or 4:3 letterbox	
480 interlace (4:3)	480 interlace (4:3)	480 interlace (4:3)



Editing & Post-Production

To maximize the value of Hi-Def images recorded with GR-HD1, the unit is supplied with high-performance editing software to create polished videos and author them to different media.

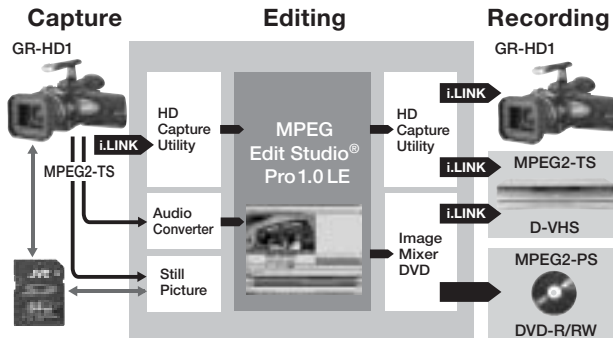
MPEG Edit Studio® Pro LE

- **Non-Linear Editing software** offering frame-accurate MPEG-2 editing of GR-HD1 footage.
- Incredibly easy **drag-and-drop interface**.
- Easy **project management**.
- **Edit spooler** takes care of edits in the background while you do something else.
- Compatible with **HD** and **SD** MPEG material.



HD Capture Utility

- Transfers **MPEG2-TS** images from **camcorder to PC**, and from **PC to camcorder** via **i.LINK**.



<Windows®>

- Displays: 1024 x 768 or above
- Video memory: 32MB or above
- Hard Disk: Ultra ATA/100 (7200rpm or above recommended)
- Other: CD-ROM drive (For installation)
- When making DVD Video discs, using ImageMixer DVD
- Recordable DVD drive that PIXELA Corporation supports is necessary.*
- DVD-RAM media cannot be supported by ImageMixer DVD.
- * Information about compatible drives will be provided at the web site of PIXELA Corporation, etc.

[When installing MPEG Edit Studio® Pro 1.0 LE] HDD unused space: Approx. 50MB or above necessary (Just for installation)

[When installing ImageMixer DVD] HDD unused space: Approx. 120MB or above necessary (Just for installation)

<Macintosh>

- This software is incompatible with Macintosh
- * note: • MPEG Edit Studio is a registered trademark of KDDI Corporation.
- Other listed corporations' and products' names are their owner's trademarks or registered trademarks.

Audio Converter 1.0

- Enables import of **MP3, WAV, WMA** files for conversion to MPEG-1 Audio Layer 2 format used by MPEG Edit Studio® Pro LE.
- Full **sound mixing and editing** support.

ImageMixer DVD

- SD MPEG-2 PS files created in MPEG Edit Studio® Pro LE can be **authored to DVD simply by dragging and dropping** the files onto the menu.
- Variety of **ready-made frames and graphics** to automatically create DVD main menu.



Full Digital Interfaces

- **i.LINK (IEEE 1394)** for transfer of MPEG-2 and DV video data to and from a PC or other compatible device like a D-VHS VCR. (Connected to JVC's HM-DH40000/DH30000, it allows 4 hours of dubbing onto a D480 D-VHS tape.)
- **USB** for transfer of digital still images to and from a PC, and for **Web-Camera** function running third-party application.
- **SD Memory Card** for storage of digital stills and transfer of data to PC with appropriate slot or external reader.



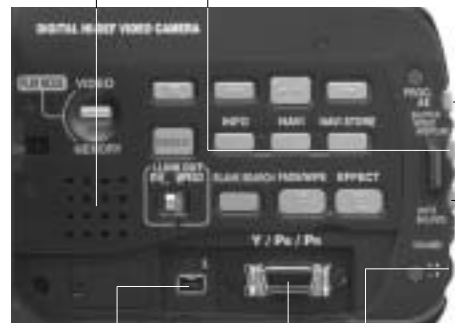
Shutter Speeds (1/15, 1/30~1/1000 sec.)

Iris (F1.8~F22, iris lock)

Speaker

Program AE

(Snow, Sports, Spotlight, Twilight)



i.LINK IEEE 1394

Component Output

White Balance
(One-touch, Halogen, Cloudy, Sunny)

Menu/Headphone Level

Active Pro-Style Design

In terms of both form and features, the GR-HD1 offers the “right fit” for the serious video enthusiast.



Rotating Grip to seamlessly shift from a high-angle to a low-angle shot without having to remove your hand from the grip.

Dedicated Carrying Handle made of die-cast aluminum for pro-style mobility.

Accessory Shoe
for optional CU-V10 microphone, etc.

High-Resolution Color Viewfinder with Diopter

3.5" High-Resolution 2 Megapixel LCD Monitor
can be used simultaneously with viewfinder.

Tally Lamp and Beep or Melody

Exposure (± 10 steps)

Manual Zoom Ring

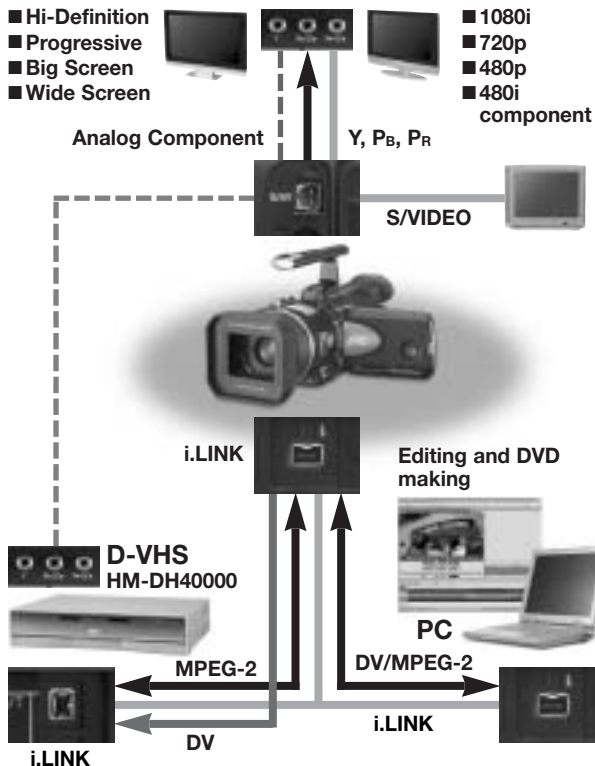
Back Light Compensation

Lens Hood

Manual Focus Ring



GR-HD1 System Interface



Provided Accessories

①AA-V40U, AC Power Adapter/Charger ②DC Cord to Charger from camera ③RM-V717U, Remote Control Unit ④USB Cable ⑤Component Video Cable ⑥S/AV/Editing Cable ⑦BN-V428U, High Capacity Battery Pack 2800 mAh ⑧Lens Cap ⑨CD-ROM with software ⑩Audio Cable x 2 for stereo microphone and headphone ⑪Audio Extension Cable ⑫Editing Extension Cable ⑬Cleaning Cassette ⑭8 MB SD Memory Card (Already inserted in the camcorder) ⑮Shoulder Strap • Carrying Handle • Lens Hood (Already attached to the camcorder) • AAA (R03) Battery x 2 (for remote control unit) • Core Filters for cables

Optional Accessories

• **VU-A100KIT, Accessory Kit**

- System Carrying Bag (soft type) x 1pc
- Battery pack, BN-V428U x 1pc
- DV PRO Tape, M-DV63PROBU x 3pcs

• **CB-A110, Hard Case**

• **WR-HD1, Marine Case** • **BN-V428, High Capacity Battery** 2800 mAh

• **VU-V840KIT, High Capacity Battery Kit** 4000 mAh

• **VU-V856KIT, High Capacity Battery Kit** 5600 mAh

• **BH-V1, Car Battery Inverter** • **CU-V10, Stereo Microphone**

• **VC-VDV204 / VDV206, DV Cables** (i.LINK/Firewire)

• **CU-ASD032 / ASD064, 32 and 64 MB SD Memory Cards**

• **CU-A80SD, Dual Interface Memory Card Adapter**

• **VU-VCKIT1D, Cleaning Kit**

And Much More

High-Speed Search Playback (HD/SD)

- "I" Frame recorded in appropriate position on tape is read for high-speed visual search.

Optical and Digital Zoom

- **10x Optical Zoom** for maximum quality. (HD/SD/DV)
- **40x/200x Digital Zoom** for super closeups. (SD/DV)

High Quality Audio

- **16-bit Digital MPEG-1 Layer 2** (HD/SD)
- **PCM Digital 2 or 4 channel** (DV)

DV Recording Modes

- **16:9 Anamorphic Squeeze Wide** records a 941x483-pixel 16:9 aspect ratio image as a regular 4:3 NTSC signal which can be expanded back to 16:9 proportions on a wide-screen TV.
- **4:3 Digital Wide** captures a wide-angle image equivalent to using a 0.7x wide conversion lens.

HG Digital Stills

- **No interline motion blur.**
- **1.5 times the vertical resolution** of conventional field stills.
- **4 image sizes:** 640 x 480 (VGA), 848 x 480 (16:9), 1280 x 720 (Panorama), 1280 x 960 (Megapixel)
- **DPOF** (Digital Print Order Format) compatible

Web Camera Function

- **Stream non-compressed raw data (camera through image or DVC footage) from camera to PC via USB interface.**
- Use for teleconferencing, video phoning or webcasting. (Requires third party application such as Microsoft NetMeeting®).

Navigation

- **Automatically stores index picture and counter information** on memory card when recording starts or at regular intervals.
- **Just choose** the index picture on-screen and playback of that scene begins automatically.

Digital Effects and Scene Transitions

- **Sepia, Classic Film, Strobe** (HD/SD/DV/Stills)
- **Black & White** (HD/Stills)
- **9 transitions:** White Fader, Black Fader, Color Fader, Corner Wipe, Window Wipe, Slide Wipe, Door Wipe, Scroll Wipe, Shutter Wipe.

Removable Carrying Handle and Accessory Shoes

- Aluminum die-cast carrying handle for high action mobility.
- Upgrade camera or handle shoe with options like CU-V10 stereo microphone.

FAQ

Does the GR-HD1 use a special JVC only format?

The GR-HD1 conforms to the specifications of the HDV format, the tentative name for a new high definition digital video recording format jointly announced in July by the JVC parent company, Victor Company of Japan, as well as by Sony Corporation, Canon Inc. and Sharp Corporation. HDV format standardization will serve to encourage third-party companies to develop editing, peripheral and other supporting products, giving professional videographers an array of options to enhance the HD creative process.

The GR-HD1 camcorder and D-VHS systems both utilize open-standard MPEG2 transport streams, letting end-users produce and distribute recordings that are compatible with broadcasting systems while preserving very high quality. MPEG2 encoding (inter-frame compression) is the same technology used in digital broadcasting.

*** How can 1 CCD provide a real High Definition picture?**

The GR-HD1 uses an extremely high density progressive scan CCD (1.18 megapixel). This CCD, together with a unique hybrid complementary primary color filter array, provides an almost 1:1 pixel correlation for the 1280 x 720P high definition mode. Thus true high definition is assured.

Why only 1280 x 720p?

The HDV format complies with both the 720 scanning lines (progressive)/1280 horizontal pixels 720p format (60p, 30p, 50p, 25p), and the 1080 scanning lines (interlace)/1440 horizontal pixels 1080i format (60i, 50i).

Progressive Scanning offers real advantages in terms of smooth and high resolution picture reproduction, especially of diagonals and curves. Interlace scanning is a technique left over from the original analog specifications of NTSC, and in some cases lends itself better for upconverted material from NTSC. Other companies have chosen this, perhaps for compatibility with their older equipment.

Progressive signals are however simpler, cleaner and more solid looking, especially when special effects are used, and when Titles are superimposed. To date CBS, NBC and HBO picked 1920 x 1080, while ABC, FOX and ESPN Networks have chosen this 720p technique for all their broadcasts. One reason is the smooth look possible with sports action. Interlace scanning suffers from dramatic resolution loss for moving objects, since it breaks up the image into two fields separated over time. The approximate 700 TV line resolution in both the Vertical and Horizontal directions (650/700) matches well with current display technology resolutions.

*** Would 3 CCDs be superior to 1 CCD?**

For absolute picture quality, yes. But there are practical trade-offs. 3 CCDs would provide superior resolution for same density of CCD. However, the HD 3 CCD camera would be larger, heavier and draw more power which requires a larger battery. The HD 3 CCD camera would also cost more.

*** How well does the camera handle fast moving objects?**

In its HD mode, the GR-HD1 provides 30 progressively scanned frames per second. For slow moving objects, the motion appears smooth. For faster motion, some judder may be noticed. This gives a feeling similar to film, which captures at 24 frames per second. If motion judder is a problem, the camera can be switched to 480/60P (SD mode), which provides 60 progressively scanned frames per second. While the resolution is less than HD mode, it is still substantially higher than NTSC 480i video. There are a few rules of thumb for shooting at lower frame rates like these. For objects in motion with respect to a video long exposure times will cause blurring of moving elements that the viewer is watching, and short exposure times will cause strobing of moving elements that the viewer is not watching tracking. Exposure time should be chosen depending on scene content, and depending on what elements in the scene are likely to be watched by the viewer. Some simple techniques like following action moving in the foreground, etc, will tend to minimize the strobing feeling, if one uses higher shutter speeds.

*** How does the picture quality of the GR-HD1 compare with a comparably priced professional 3 CCD hand held NTSC camera?**

It depends upon the camera; they really are different! Compared with the GR-HD1, JVC's Pro division makes the GY-DV300U which has extremely good color reproduction, highlight handling, shadow reproduction, and sensitivity. However the GR-HD1 has higher recordable resolution in both the horizontal and vertical direction. Compared with other 3 CCD hand helds, there is quite a range of performance. Some will have attributes similar to the GR-HD1 (even though they are 3 CCD), but with much lower resolution.

Can the GR-HD1 produce 24P (progressive frames/sec.) just like film?

In HD mode, the GR-HD1 produces 30 progressive frames per second. While this is not exactly 24P, it gives the visual feeling very similar to the motion of film.

How can I play back a tape produced on the GR-HD1? Can I use a DV VCR? Can I use any other type of deck?

Of course, tapes can be played back by the camera itself. If the tape was shot in the 720P (HD) or 480P (SD) modes, it cannot be played back on a standard DV VCR. Tapes shot in the 480i (DV) mode are completely compatible and can be played back on any DV VCR. In addition, tapes can be dubbed to a JVC HD DVHS VCR via the firewire connector.

**What kind of monitoring equipment do I need?
Can I use a standard resolution monitor during recording or for playback?**

The GR-HD1 offers tremendous flexibility for monitoring. For best performance and accuracy, choose a monitor which can display 720P as its native resolution. The camera can play back at virtually any rate including 1080i, 720P, 480P or 480i. The 480i signal is available both in component as well as composite and S-video, so you can use a standard NTSC monitor for reviewing tapes in the field.

Can I manually control the audio level?

No. The audio level is always automatic via an AGC circuit. The dynamic range is so wide, this normally proves to be no problem.

Can I manually control the zoom and focus?

Yes. Zoom can be controlled either by a variable speed rocker control, or a zoom ring on the lens. Focus is either automatic or manual via a focus ring.

Can I manually control the iris?

Not directly, but you can achieve a similar result. The auto iris can be offset up or down to achieve greater or less exposure. Once you get the exposure you like, the iris can be locked so it will not change regardless of scene changes.

What is different between the JY-HD10U (professional model) and the GR-HD1 (consumer model)?

The cameras are mostly similar, but there are a few differences which cater to professional needs. The professional version has 2 XLR (unbalanced) microphone connectors vs. a mini jack. Other differences include a color bar generator, audio level indicator in the viewfinder and a higher resolution viewfinder (180,000 vs. 113,000 pixels). There is some difference in picture quality, especially edge enhancement which has been balanced, shaped and reduced to match professional applications.

How can I edit the material shot by the GR-HD1? Can I use any other editing software?

A basic non linear editing program is included with the camera, and there are other alternatives. Cine Form has announced a plug-in for Adobe Premiere which will be shipping by early August. Because of the tremendous interest generated by this camera, virtually all of the major NLE manufacturers working on solutions to work with the GR-HD1.

Do I need any special cables to view or record the footage from the GR-HD1?

No. The GR-HD1 includes a component cable with RCA adapters. Another breakout cable provides composite, S-video and audio. For dubbing the footage to a DVHS VCR or computer, a standard 4 pin firewire cable (not supplied) is required.

Specifications

CCD Pixel	1/3" 1.18 Megapixel Progressive Scan with Hybrid Complementary-Primary Digital Filter	
Recording System	MiniDV format, HD Digital VCR Conference's Part 7(DVB) DVC-SD, DVCATV/DVB compliant.	
Area for motion pictures	1280x720/30p ATSC HD	480/60p Widescreen ATSC SD
	HD	720/30p (16:9)
	SD	480/60p (16:9)
	DV	480/60i (16:9/4:3)
Area for still pictures	1280 x 960 (4:3)	DSC DSC/Video/TAPE→CARD Video/TAPE→CARD Video/TAPE→CARD
	640 x 480 (4:3)	
	848 x 480 (16:9)	
	1280 x 720 (16:9)	
Horizontal / Vertical Resolution	HD 16:9 16:9 Widescreen 4:3 SD	700 Lines 400 Lines 540Lines
Lens Specifications	F1.8-1.9 f=5.2mm ~ 52mm /Filter Diameter : 52mm	
Optical Zoom Ratio	10x Optical / 200x Digital Zoom	
Optical Picture Stabilizer	●	
Sensitivity	35 Lux minimum illumination	
LCD Monitor	3.5 inch color (200,000-pixel polycrystalline silicon LCD)	
Viewfinder	0.44 inch color (113,000-pixel polycrystalline silicon LCD)	
Digital Audio Signal Recording	16-bit Digital MPEG-1 Layer 2 (HD/SD/DV)	PCM Digital 2 or 4 channel (DV)
Power Source	DC 6.3V (using AC Adapter), DC 7.2V (using Battery Pack)	
Power Consumption	HD/ SD mode 8.0W (using viewfinder), 9.7W (using LCD viewfinder), 8.5W (using LCD monitor)	monitor) DV mode 6.8W (using
Continuous (Actual) recording time*1	HD/SD mode	DV mode
Using viewfinder:	BN-V416 BN-V428	1 hr. 15 min. (37 min.) 2 hr. 15 min. (1 hr. 8 min.)
Using LCD monitor:	BN-V416 BN-V428	1 hr. 00 min. (30 min.) 1 hr. 50 min. (55 min.)
Dimension Size (W/H/D)mm	105.5 x 99 x 241	
Weight	1210g	

* 1 Note...Continuous recording time, actual recording time, and number of still pictures are approximate.

Still Picture Format	JPEG compliant, DCF, Digital Print Order Format			
Picture Capacity (Fine/Standard)	SD Memory Card (ex)		MultiMediaCard (ex)	
	8MB ~ 64MB		8MB ~ 32MB	
640 x 480 (4:3)*	30/80	297/772	36/95	149/388
848 x 480 (16:9)*	25/66	241/643	29/79	121/323
1280 x 720 (16:9)*	10/26	99/257	12/31	49/129
1280 x 960 (4:3)	7/20	74/193	9/23	37/97

*These sizes also recordable on tape.

<Digital Effects & Scene Transitions>

Digital Effects	Sepia/Black & White/Classic Film/Strobe
Fader Mode	Black/White/B&W
Wipe	Corner/Window/Slide/Door/Scroll/Shutter
Slow Shutter	x 4, x 10
Playback Digital Zoom	20x (RCU only)
Wide	Squeeze/Digital Wide (only480i)

<I/O Terminals>

i.LINK Terminal	4pin(IEE1394) /2position Output <DV /MPEG-2>
D Terminal	<D1 ~ D4> (Y, P _B , P _R)
USB	5pin Mini-USB B-Type
Analog Input	only DV
PS/AV/Editing Terminal	●
MIC Input	●
Head Phone Output	●

<Bundle of Software>

MPEG Edit Studio Pro LE
HD Capture Utility
Audio Converter
ImageMixer VCD/DVD
G.726 Decoder
USB Video Streaming Driver